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# ***MASTER OF MILITARY STUDIES***

**THE HISTORY OF HEAVY LIFT: CAN THE 1947 VISION OF AN ALL HEAVY  
HELICOPTER FORCE ACHIEVE FRUITION IN 2002?**

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## EXECUTIVE SUMMARY

**Title:** The History of Heavy Lift: Can the 1947 vision of an all heavy helicopter force achieve fruition in 2002?

**Author:** Major James D. Barich, United States Marine Corps.

**Thesis:** In 1947, in an effort to orient the Marine Corps away from the last war and toward the next, the Marine Corps conceived the Vertical Assault Amphibious Doctrine and the vision of an all heavy lift helicopter transport force to execute it. Can the unrealized vision of 1947 of an all heavy helicopter force be achieved in 2002?

**Discussion:** The 18th Commandant, General Alexander A. Vandegrift, seeking alternatives to the World War II amphibious landing, chose General Geiger, as his personnel representative to witness the first atomic explosion at Bikini Atoll in the Marshall Islands. Upon conclusion of the atomic tests, General Geiger stated, "I cannot visualize another landing such as was executed at Normandy or Okinawa." Subsequently the Commandant tasked his most experienced amphibious commanders to, "Compose a special board to propose ... concepts and principles which the Marine Corps should follow ... to fit it to wage successful amphibious warfare in the future." Upon considering a variety of options to include: amphibious transport aircraft, gliders, parachute battalions, troop carrying submarines and an infant technology called the helicopter; the Board recommended the Vertical Assault Doctrine which rested on the development and implementation of a large or heavy lift helicopter able to carry 20 Marines and land a Division. The helicopter designed to fill this role was the HR2S-1. However, due to the Korean War and the design and production problems of the HR2S-1, the Marine Corps chose to replace it with a medium lift interim helicopter called the HUS-1 (also known as the UH-34). The demise of heavy lift as the backbone of the Vertical Assault Doctrine truly began with the fact that the technology of a heavy lift helicopter was not feasible until 1955, by which time the Marine Corps had reoriented to become a medium lift force. The Marine Corps did eventually develop the CH-53E heavy lift helicopter; however, never with the intention of replacing the medium lift force. In an ironic twist of fate the medium lift replacement MV-22 has encountered long delays in testing and production reminiscent of the HR2S-1. Hence, the CH-53E has filled the major role as an interim helicopter in the Doctrine of Operational Maneuver from the Sea (OMFTS).

**Conclusion(s) and Recommendation(s):** The MV-22 is a replay of the lessons learned in the development of the HR2S-1. The production plagued MV-22 has left the Marine Corps in the position of executing OMFTS without the centerpiece of the Osprey. Therefore, the Marine Corps should expedite the Service Life Extension Program (SLEP) for the CH-53E, re-open the production line and take this opportunity to return to the original 1947 concept of an all heavy lift, long range helicopter force that would permit the immediate execution of all OMFTS missions.

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## **Introduction**

“A military force without helicopters in the future will be obsolete.”

Lieutenant Colonel  
Keith B. McCutcheon  
1951<sup>1</sup>

The advent of the atomic age would move Marine Corps amphibious doctrine in a new direction that would reshape the Marine Corps for all its future. General Geiger, an aviator who had taken part in amphibious landings in the operations of Bougainville, Guam, Peleliu and Okinawa, was chosen as the Commandant's representative to witness the first underwater atomic explosion at Bikini atoll in the Marshall Islands. The force of this new weapon made him extremely concerned that an enemy in possession of the same capability could quickly obliterate a Marine invasion force. He urged General Alexander A. Vandegrift, the 18<sup>th</sup> Commandant, to seek alternatives to the World War II amphibious landing. The genesis of helicopters in the Marine Corps had begun.

What General Vandegrift set in motion was the beginning of a new doctrine that would be known as the Vertical Assault Concept for Amphibious Operations. General Vandegrift established a series of boards to investigate alternative methods to amphibious operations mounted by conventional surface craft. The conclusion of these early boards was that the infant technology of the helicopter presented the best option for a radical change in Marine amphibious doctrine.

In pursuance of the Commandant's guidance of exploring this new technology, the Committee of the Academic Board, headed by Colonel Robert E. Hogaboom, at Marine Corps Schools, Quantico, submitted its first report on the desired characteristics for an assault transport

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<sup>1</sup> Lieutenant Colonel William R. Fails, USMC, Marines and Helicopters 1962-1973 (History and Museums Division HQMC, Washington, D. C. 1978) p. ii.



helicopter. Entitled “Military Requirements of Helicopter for Ship-to-Shore Movement of Troops and Cargo,” the report stated:

On the premise that the helicopter offers a valuable means of accelerating ship-to-shore movement, it is recognized that the complete replacement of all existing ship-to-shore conveyances may at some future date be desirable. Under such conditions, it would appear necessary that there be designed ... large type helicopters capable of lifting divisional loads.<sup>2</sup>

This report clearly shows that in 1947 the Marine Corps had decided to pursue the Vertical Assault Concept with what they termed “large” type helicopters. This term denoted a machine that could transport 20 fully equipped combat Marines. As the Vertical Assault Concept matured, the term “large” would become synonymous with “Heavy Lift.”

In 1948, using five of the Marine Corps only existing helicopters, aircraft that could carry one pilot and two to three passengers maximum, the Marines conducted various amphibious exercises. The exercises validated the value of the helicopter in the movement of assault troops in an amphibious operation. With the concept validated, the Marine Corps in 1949 submitted its request for a multi-engine, large assault transport helicopter, capable of carrying twenty combat equipped troops. This helicopter would eventually bear the name of the HR2S-1.

Since 1947, the Marine Corps had had a vision to assault the beaches by filling the skies with waves of large transport helicopters and landing the assault elements of one Marine division in continuous echelons. The journey of making a large transport helicopter to fulfill this vision would entail squashed hopes, setbacks, and almost total defeat. However, a large transport helicopter would eventually emerge with a false start in 1955 with the HR2S-1, a helicopter that the Marine Corps had placed its entire hopes on, and a complete success in 1972 with the introduction of the CH-53E Super Stallion.

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This paper will provide a historical analysis of the evolution of the heavy lift helicopter, beginning with the very first helicopter, the Vought-Sikorsky 300 (VS-300), continuing on to the dashed hopes of the HR2S-1, and ending with the CH-53E Super Stallion, the aircraft currently in use. This analysis is provided to answer the fundamental questions:

1. Why did the Marine Corps develop "Heavy lift"?
2. Why did "Medium Lift" usurp "Heavy Lift" in the newly developed Vertical Assault Concept for Amphibious Operations?
3. Should "Heavy Lift" assume the major role in the Marine Corps doctrine of Operational Maneuver from the Sea (OMFTS)?

### **Birth of the Marine Corps Helicopter Program**

“The ability of the helicopter ... qualify it admirably as a supplement or substitute for the slower, more inflexible craft now employed in the ship-to-shore movement.”

Lieutenant Colonel  
Victor H. Krulak  
1948<sup>3</sup>

In June of 1946, the Commandant of the Marine Corps (CMC), General Alexander A. Vandegrift, established a billet for one officer and three enlisted men within Headquarters Marine Corps (HQMC) to keep track of the development of a new technology called the helicopter and all details related to its application.<sup>4</sup>

The Commandant's new program sat idle with no major accomplishments until, in July of the same year Lieutenant General Roy S. Geiger, Commanding General, Fleet Marine Forces,

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<sup>2</sup> DCNO (Ops) Memo to DCNO (Air), dtd 6 May 47, Subj: Employment of Helicopters in Amphibious Warfare, p. 7.

<sup>3</sup> LtGen Victor H. Krulack ltr to the Dir MCHHist&Mus, dtd, 3 Aug 70. Comment file, "Developmental History of the USMC, 1900-1970."

<sup>4</sup> Lieutenant Colonel Eugene W. Rawlins, USMC, Marines and Helicopters 1946-1962 (History and Museums Division HQMC US Marine Corps) 1976 p. 11.

Pacific (CGFMFPac) viewed the first atomic tests at Bikini Atoll as the Commandant's personal representative. During WWII General Geiger had become an expert on amphibious assault techniques, having commanded the III Amphibious Corps, which took part in operations on Bougainville, Guam, Peleliu, and Okinawa. Upon conclusion of the atomic tests General Geiger submitted a report to the Commandant on 21 August, in which he expressed his opinion concerning the effects that the atomic bomb might have on Marine Corps doctrine during the post WWII period. General Geiger stated, "since our probable future enemy will be in possession of this weapon, it is of my opinion that a complete review and study of our concept of amphibious operations will have to be made." General Geiger went on to say, "It is quite evident that a small number of atomic bombs could destroy an expeditionary force as now organized, embarked and landed ... I cannot visualize another landing such as was executed at Normandy or Okinawa." In his conclusions and recommendations he urged the Commandant to "consider this a very serious and urgent matter and that the Marine Corps use its most competent officers in finding a solution to develop the technique of conducting amphibious operations in the Atomic Age." <sup>5</sup>

The Commandant concurred with General Geiger's assessment and immediately convened a special board consisting of Major Generals: Lemuel C. Shepard, Jr., Oliver P. Smith, and Field Harris, to research and recommend new principles which the Marine Corps could follow to execute successful amphibious warfare in the future. The Commandant wanted special attention given to developing special principles that would orient the Marine Corps away from the last war and towards the next. The final paragraph of a set of special instructions given to the

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<sup>5</sup> LtGen Roy S. Geiger ltr to CMC, dtd 21 Aug 46.

newly convened board spelled out exactly what the Commandant was intending the board to accomplish:

... the Special Board... is directed to propose, after thorough research and deliberation, the broad concepts and principles which the Marine Corps should follow, and the major steps which it should take, to fit it to wage successful amphibious warfare at some future date...<sup>6</sup>

General Shepard's special board was subsequently staffed with a Secretariat of three officers:

Colonel Merrill B. Twining, Colonel Edward C. Dyer, and Lieutenant Colonel Samuel R. Shaw.

The Secretariat, conducting the majority of the research, agreed that the mass destructive capability of the atomic bomb and the vulnerability of a massed amphibious landing force made dispersion a necessity. However, to disperse the landing force sufficiently and as equally important, have a reconcentration of forces at the point of contact with the enemy, a new mode of assault was needed as a supplement if not a replacement to the existing amphibious landing craft.<sup>7</sup>

To solve this problem, the newly formed special board and the secretariat, together now known as the committee, researched a variety of options to achieve a rapid buildup of assault forces ashore. The five primary options discussed were: transport aircraft, gliders, parachutists, troop and cargo carrying submarines and helicopters.

The committee concluded that transport aircraft would require prepared airfields, which in most cases, would not be available within the objective area. Gliders similarly required a clear and flat area in which to land and debark troops. The concept of an assault employing parachutists was dropped because of the difficulty it required in maintaining unit integrity. The troop and cargo submarine appeared for a short time to be the best non-airborne solution;

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<sup>6</sup> CMC ltr to Chairman, Special Board, dtd 13 Sep 46, Subj: Effect of Atomic Explosion on Amphibious Warfare.

<sup>7</sup> Lieutenant Colonel Eugene W. Rawlins, USMC, Marines and Helicopters 1946-1962 (History and Museums Division HQMC US Marine Corps) 1976 p. 13.

however, technical details in its development would prove unrealistic. The committee also considered the employment of the helicopter, which appeared to be superior in characteristics to all other assault vehicles, and offered a practical means of overcoming the effects of dispersion, while reducing exposure of the amphibious task force.<sup>8</sup> The committee knew that the development of the helicopter was in a relative primitive state, however, this did not curtail their interest in its application.

The first true helicopter in the Western Hemisphere appeared in 1939. Igor I. Sikorsky, a Russian-born aircraft designer and builder, successfully test flew the first practical helicopter, the Vought-Sikorsky 300 (VS-300). Realizing the potential value of Sikorsky's new helicopter, on 10 January 1941 the U. S. Army Air Corps awarded a contract for an experimental platform called the XR-4, which was to be built on the basic principle but expanded scale of the VS-300. It took the Sikorsky plant one year to build and fly the first R-4 with success. They subsequently improved on the original version creating the R-5, and R-6 in late 1943. In the evaluation of these new helicopters the R-5 model with its 450-horsepower engine, proved to be the most successful of the three prototypes. Later, a three-passenger version of the R-5 was designated by Sikorsky as the S-51 and by the Navy in 1946 as the HO3S-1.

While Sikorsky is given the credit for being the first designer to build a practical helicopter, there were other American designers soon producing useful rotary-winged aircraft. The Piasecki Corporation and the Bell Aircraft Corporation were also developing, manufacturing and testing their own helicopters. The three manufacturers of Bell, Piasecki and Sikorsky most directly influenced the development of both the Navy's and Marine Corps' helicopter programs;

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<sup>8</sup> Ibid p. 13.

however, we shall concentrate on the Sikorsky development of helicopters since it is the manufacturer which will eventually produce the CH-53E Super Stallion Heavy Lift Helicopter.

By the end of 1946, the total number of helicopters in the Navy inventory was twenty aircraft consisting of various R-4, R-5's and R-6's. Unfortunately, helicopters produced in the late 1940's were far from an acceptable service aircraft. However, the optimism of the manufacturers and the eagerness of the military to obtain a variety of larger, more useful helicopters, proved to be the impetus that provided the stepping stones in an orderly, albeit slowly, helicopter developmental program.

The committee continued its research and deliberations and continued to narrow down its recommendations to two concepts. The first concept involved the use of helicopters to conduct ship-to-shore movement of assault troops. The second concept dealt with using large assault transport seaplanes. Although the helicopter was at least in its rudimentary stage of development, the large assault seaplane designed to carry troops and their equipment was not in existence. Therefore, recognizing that they were leaning heavily in the direction of utilizing the new rotary wing technology of the helicopter as a possible new method of amphibious assault, they felt that they should at a minimum educate themselves first hand on the capabilities of the helicopter.

Colonel Dyer visited Sikorsky Aircraft Company and met with Mr. Sikorsky followed by Colonel Dyer and Twining visiting Piasecki Aircraft Corporation and meeting with Mr. Piasecki. They discussed with both men the concept and requirements that the Marine Corps was exploring. Both Mr. Sikorsky and Piasecki greeted the ideas with enthusiasm and pledged that their companies had the technology, ability and capabilities to fulfill the requirements for the Marine Corps and create 10 and 40 passenger transport helicopters ideally suited for the Marine Corps concept of an assault transport helicopter.

Having validated the concept with the existing manufacturers, one would have thought that the helicopter program would have become the number one priority for the committee. Interestingly enough Colonel Dyer relates that the helicopter program began to die on the vine due to the committee working on other projects. However, after witnessing an impromptu demonstration of Lieutenant Colonel Marion E. Carl, a Patuxent River test pilot, fly a helicopter to Quantico and hoist Lieutenant Colonel Victor H. Krulak off the ground and 15 feet into the aircraft; Colonel Dyer and Twining received the motivation to accelerate the program to a finish by completing its writing.

In December 1946 the committee submitted its report to the Commandant recommending that two parallel programs to develop the transport seaplane and a transport helicopter be implemented. Furthermore, they suggested that the Marine Corps Schools be directed to create a tentative doctrine for helicopter employment. Exactly three days after receiving the report General Vandegrift endorsed the recommendations and directed the Marine Corps Schools to begin development of the programs. In addition, in what became the first known service document to propose the use of helicopters as a tactical delivery vehicle of combat troops from a naval vessel; General Vandegrift sent a letter with the report as an enclosure to the CNO outlining the Marine Corps plan for what would later become known as the Vertical Assault Concept for Amphibious Operations.<sup>9</sup> In his letter the Commandant briefly defined the concept and the premises upon which it was based, he stated:

With a relatively unlimited choice of landing areas, troops can be landed in combat formations and under full control on the flanks or rear of a hostile position. The helicopter's speed makes transport dispersion at sea a matter of no disadvantage and introduces a time-space factor that will avoid presenting at any one time a remunerative atomic target. It should be noted also that transport helicopters offer a means for rapid

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<sup>9</sup> Ibid. p.14.

evacuation of casualties, for the movement of supplies directly from ship to dump and for subsequent movement of troops and supplies in continuing operations ashore.<sup>10</sup>

With his letter to the CNO the Commandant indelibly linked the Marine Corps to the future of rotary wing aviation.

### **Korea: Helicopters in combat**

“ ... the evolution of a set of principles governing helicopter employment cannot wait for the perfection of the craft itself, but must proceed concurrently with that development...”

Colonel  
Victor H. Krulak  
1948<sup>11</sup>

25 June 1950, seven infantry divisions and an armored division of the North Korean People's Army crossed the thirty-eighth parallel and invaded the republic of Korea.<sup>12</sup> Within hours of the attack, Harry S. Truman, President of the United States, began a massive diplomatic counterattack in the United Nations. In the Security Council the United States pushed through a resolution branding the North Koreans as aggressors, demanding a cessation of hostilities, and requesting a withdrawal behind the 38th parallel. The resolution's sweeping nature gave the United States the advantage of United Nations approval and support for military action in Korea.

The United States began providing military support to South Korea on 30 June 1950, when President Truman authorized the Commander in Chief, Far East (CinCFE), General of the Army Douglas MacArthur, to use American Forces to oppose any further North Korean advances. Anticipating the use of Marines in the rapidly deteriorating Korean situation, units in

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<sup>10</sup> CMCS ltr to CMC, dtd 10 Mar 47, Subj: Employment of helicopter in Amphibious Warfare, Encl (a), Military Requirements of Helicopter for Ship-to-Shore Movement, p.3.

<sup>11</sup> LtGen Victor H. Krulak ltr to Dir MCHist & Mus, dtd 3 Aug 70.

<sup>12</sup> Lieutenant Colonel Gary W. Parker, USMC, History of Marine Medium Helicopter Squadron 161 (History and Museums Division, HQMC Washington D. C. 1982) p.13.



the 1<sup>st</sup> Marine Division and 1st Marine Aircraft Wing were given warning orders to prepare for movement overseas. Camp Pendleton and Marine Corps Air Station El Toro, California, became hubs of predeployment activity. On 7 July 1950, the 1<sup>st</sup> provisional Marine Brigade was activated in response to General MacArthur's request for the immediate dispatch of a Marine regimental combat team with supporting air.<sup>13</sup>

Previously, in 1947 the Commandant recommended to the CNO that implementation begin immediately on the two programs recommended in the Special Board's report. The result of this implementation gave the Marine Corps its first usable helicopter, the Sikorsky HO3S-1 (H-helicopter, O-observation, 3-third model in the design, S-Sikorsky), and it arrived on 9 February 1948. The HO3S-1 was a four seat, observation-utility helicopter with a single three-bladed main rotor and torque compensating tail rotor powered by a 450-horsepower Pratt & Whitney R-985-AN-5 Wasp Jr., nine-cylinder, radial-cooled engine. Originally, the helicopter weighed 3,788 pounds empty with a maximum take-off weight limited to 4,988 pounds. This gave the HO3S-1 the ability to carry 1,200 pounds and cruise at 85 miles per hour. The Marine Corps model had tricycle landing gear, a 300 pound capacity rescue hoist and the pilot sat in the front center and a bench style seat aft of the pilot accommodated three passengers.<sup>14</sup> The HO3S-1 saw extensive service in Korea with Marine Observation Squadron 6 (VMO-6). The helicopters of VMO-6 were used for search and rescue, reconnaissance, and command and control. The command and control missions were particularly important during the opening phase of Korea, because it allowed the brigade commander to make rapid, first hand appraisals of the tactical situation, and to conduct spot briefings with his subordinate commanders.

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<sup>13</sup> Ibid. p. 13.

<sup>14</sup> Navy Dept, Bureau of Aeronautics (BuAer) Standard Aircraft Characteristics, Performance Summary Sikorsky HO3S-1, dtd 1 Feb 49.

Resupply operations became an increasingly important support function of the HO3S-1. The mountainous terrain and extreme heat of Korea caused Marines to collapse from heat exhaustion if not supplied with sufficient water. The HO3S-1 could accomplish in minutes what it took supply bearer's hours to carry food and water into the mountains. Additionally, the rugged terrain and poor road systems made evacuation of casualties extremely hazardous. The HO3S-1 additionally performed in the role of casualty evacuation (CASEVAC) able to carry one litter patient in a makeshift manner in the passenger compartment.

In 1948, there was not a helicopter specifically designed for military observation in actual production. The HO3S-1 was an off the shelf product that the Marine Corps had easily converted for military observation use. Looking for an observation helicopter with improved size, configuration and gross weight, the Commandant requested the CNO to contract for the design and procurement of a light helicopter to specifically meet the requirements for a military observation helicopter. The new helicopter should fulfill the following seven specifications:

1. Maximum visibility.
2. Extreme maneuverability.
3. High rate of climb.
4. Performance and internal space sufficient to carry two litters or a limited amount of cargo.
5. Capability of sustained flight with all or part of one rotor blade missing.
6. Interchangeable and foldable rotor blade for simplicity of maintenance and stowage of aircraft.

7. Provisions for quick (five minutes or less) installation of television and electronic reconnaissance equipment.<sup>15</sup>

The result was the Sikorsky HO5S-1. The first HO5S-1 entered service in Korea during July 1952. The HO5S-1 was a three-seat utility helicopter capable of carrying up to 750 pounds. For short-range flights, four passengers could be accommodated, and with seats removed, two litter patients could be carried completely inside the cabin, in addition to the pilot and attendant. The HO5S-1 had three main rotor blades and a two-bladed tail rotor and four landing gear. It was the first U. S. helicopter to be fitted with all metal blades. The HO5S-1 was powered by a 245-horsepower Franklin 6V6-245-B16F, six cylinder, vertically mounted, fan cooled engine. It could reach a maximum speed of 110 miles per hour but normally cruised at 96 miles per hour.<sup>16</sup> The increased carrying capacity and performance of the HO5S-1 allowed the Marine Corps to start thinking in the direction of large heliborne troop lifts.

The first true assault transport helicopter, the HO4S-1, arrived in Korea on 2 September 1951 as part of the newly formed Marine Helicopter Transport Squadron 161 (HMR-161). Prior to 1950 this type of assault transport helicopter did not exist. It was the zeal of a group of dedicated Marines known as the Marine Corps Board and the subsequent actions of the Division of Aviation that not only kept the vision for a transport helicopter alive, but also were developing the principles governing its employment without the actual airframe existing. As part of the 1946 Special Board recommendations to Commandant Vandegrift, and General Vandegrift's subsequent letter to the CNO to implement the recommendations of the Board, Marine Helicopter Squadron 1 (HMX-1) was commissioned in 1947 at Quantico, Virginia, and is often

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<sup>15</sup> CNO ltr to Dist List, dtd 16 Aug 49, Subj: Navy Research and Development Plan; Operation Requirement No. A0-17503 (Liaison Helicopter), p. 2.

<sup>16</sup> Navy Dept, BuAer Standard Aircraft Characteristics, NavAer 1335A, Performance Summary, Sikorsky HO5S-1, dtd 1 May 51.

cited as the official beginning of rotary-winged aviation within the Marine Corps. HMX-1 had a two-fold mission: 1. Develop techniques and tactics in connection with the movement of assault troops in amphibious operations. 2. Evaluate a small helicopter as a replacement for the present fixed-wing aircraft used in gunfire spotting, observation and liaison missions in connection with amphibious operations.<sup>17</sup>

In 1948, at the suggestion of Lieutenant Colonel Victor H. Krulak, Assistant Director of the Senior School, Quantico, Virginia, HMX-1 participated in an annual joint Navy and Marine training exercise, Operation PACKARD II. This exercise was to simulate a ship-to-shore assault landing against an enemy defended beach. Operation PACKARD II would provide the ideal opportunity for HMX-1 to test the movement of troops by helicopters in a ship-to-shore movement. Having only five helicopters at the time commanding officer, Lieutenant Colonel Dyer remarked, “ No one could ever characterize a flight of five helicopters carrying three Marines apiece as an overwhelming force, but Krulak felt -and I agreed- that we [HMX-1] should go on board the ship and ... make ... a landing.”<sup>18</sup>

HMX-1 concluded from its participation in PACKARD II that “transport helicopters were urgently needed if combat troops were to be landed expeditiously and in a battle formation.”<sup>19</sup> From the standpoint of HMX-1, the operation had been a complete success in achieving its limited objective of determining the value of the helicopter in the movement of assault troops in an amphibious operation. As a result the Marine Corps planners became firmly committed to the new technique of vertical assault in amphibious operations. The following year, having participated in PACKARD III, Colonel Dyer in a letter to the Commandant stated, “ the

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<sup>17</sup> CMC ltr to CO MCAS Quantico, dtd 3 Dec 47 Subj: Marine Helicopter Squadron One, employment of.

<sup>18</sup> Lieutenant Colonel Eugene W. USMC, Rawlins, *Marines and Helicopters 1946-1962* (History and Museums Division HQMC US Marine Corps) 1976 p. 24.

<sup>19</sup> *Ibid.* p. 25.

squadron's recent participation in PACKARD III has proved that helicopter operations are highly successful .... and therefore... development of a carrier based transport [helicopter] is now justified.”<sup>20</sup> This led to a formation of a seven-man study group led by Lieutenant Colonel Bowman, known as the Bowman Board, to study and submit recommendations on a transport helicopter program, with a specific recommendation for a specific type of helicopter most suitable for Marine Corps use. Subsequently, the board submitted to General Clifton B. Cates, CMC, the general requirements for a transport helicopter, which could be procured between the years 1952 and 1953, which would most nearly meet Marine Corps requirements. Based on specifications submitted over the last two years the general specifications were:

Range: 250 nautical miles

Payload: 3,000 to 3,500 pounds

Capacity: 13 to 15 combat troops @ 225 pounds, 2 pilots @ 200 pounds

Stowage: To fit the elevator of a CVE-105-class aircraft carrier and be capable of being stowed and moved about the hangar deck.

Date required: 1952-1953 <sup>21</sup>

On 12 January 1950, as a result of the Bowman Board recommendations, the Commandant made a request that the CNO procure for the Marine Corps the 13- to 15-man assault helicopter. He pointed out that employment of helicopters from CVE-105 class carriers was entirely feasible and practical. It was a rigid requirement the aircraft not only be capable of operating on the flight deck, but also be able to move to the hangar deck for storage and maintenance. General Cates made it known that “helicopters employed by HMX-1 did not possess the required minimum range, payload and troop capacity for the Marine Corps

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<sup>20</sup> CO HMX-1 ltr to CMC, dtd 25 Jun 49, Subj: Transport Helicopters, development and procurement of.

employment as assault helicopters.” Further, “emphasis should be placed on allocation of funds toward the proposed helicopter ... and given number one priority.”<sup>22</sup>

Admiral Sherman acknowledged the Commandant’s letter on 2 February with a short statement: “The importance of the assault helicopter program to the Marine Corps is recognized. Consideration of this problem by various OpNav Divisions and BuAer Branches is necessary and is being undertaken.”<sup>23</sup>

With this concurrence, the Navy’s Air Readiness Division did act; however, they revised the operational requirements for an assault helicopter of the type specified in General Cates’ letter of 12 January. The new specifications were contained in the Navy Research and Development Plan, Operational Requirement Number AO-17501 (Rotary Wing Assault Helicopter). The listed requirements were: “develop a rotary wing assault craft capable of transporting combat equipped troops from transport vessels to beachheads in support of landing operations...” and “that 20 combat equipped troops be transported with the weight of each man computed at 225 pounds.” The assigned functions in AO-17501 for the helicopter were to “operate from a CVE or larger carrier, or between carriers and suitable equipped transport ships, carrying assault troops with their initial requirements in supply, communications and organic weapons.”<sup>24</sup> Two of the main features listed were that it be multi-engine equipped and an overall dimension compatible with movement on the elevator of the CVE-105 class carrier. This put the Marine Corps on the path to finally attaining a large assault transport helicopter between the timeframe of 1952 and 1953. The operational requirement did not assign a model designation;

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<sup>21</sup> Senior Member, Board to Study and Submit Recommendations on a Transport Helicopter Program, Report to CMC dtd 14 Oct 49, Subj: Transport Helicopter Board, Report of, p. 2.

<sup>22</sup> CMC ltr to CNO, dtd 12 Jan 50, Subj: Marine Corps assault helicopter requirements.

<sup>23</sup> CNO ltr to CMC, dtd 2 Feb 50, Subj: Marine Corps assault helicopter requirements.

<sup>24</sup> CNO ltr to Dis List, dtd 4 Apr 50, Subj: Navy Research and Development Plan; Operational Requirement No. AO-17501 (Rotary Wing Assault Helicopter), encl (1), pp. 1-3.

however, the twin-engine assault support helicopter would eventually bear the Sikorsky S-56 trademark and the Navy designation HR2S-1.

The outbreak of the war in Korea forced a change in Marine Corps helicopter development. The off the shelf purchase of the HO3S-1 and HO5S-1 were adequate for the mission of a light observation helicopter, but far inadequate to engage in the role of a full-fledged assault transport helicopter. It became apparent that the timetable for the delivery of the HR2S-1 was now unrealistic due to the war. On 21 July 1950, the Division of Aviation's General Wallace addressed a memorandum to the CNO's Air Readiness Division requesting "necessary steps be taken to immediately procure 40 [interim] transport helicopters, preferably of the Sikorsky HO4S-1 type."<sup>25</sup> Admiral Cassady, DCNO (Air), acted immediately on the request, forwarding it to BeuAer. The admiral's directive instructed the Bureau of Aeronautics to procure 40 HO4S-1 for equipping two 15-plane squadrons the Marines had requested. In addition to the Marine Corps immediate needs, Cassady stressed the urgency of accelerating the timetable for future procurement of the 20- to 26-man ultimate assault transport helicopter defined in operational requirement AO-17501, the HR2S-1.

The HO4S-1 was the Navy's designation for the Sikorsky commercial Model S-55. Sikorsky built the helicopter without the aid of government funding. It had been built to compete against a Piasecki helicopter for use as the Air Force's Artic Rescue Helicopter. Upon completion of a competition between the two aircraft, in May 1950, the Air Force chose the Piasecki helicopter. This left Sikorsky with no contract for the S-55. The Marine Corps seizing

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<sup>25</sup> OP-52 memo to OP-55, dtd 21 Jul 50, Subj: Transport Helicopter, immediate procurement of.

the opportunity moved quickly and contracted with Sikorsky immediately for production and received its first aircraft in six months.<sup>26</sup>

The Sikorsky made HO4S-1, re-designated the HRS-1 transport helicopter (also known as the CH-19), was a single main rotor and vertical tail rotor helicopter. The aircraft was designed to cruise at 90 knots and had a payload of 1,420 pounds at sea level with a crew of two and a full load of gas and oil. Under field conditions in mountainous terrain, the HRS-1 could lift either four to six troops with combat equipment, up to 1,500 pounds of cargo, or three to five casualties in litters.<sup>27</sup> Large doors helped in unloading troops quickly in a forward combat zone, or in rescue operations. The HRS-1 also had folding rotor blades for simplified shipboard stowage.

Marine Helicopter Transport Squadron 161 (HMR-161), the Marine Corps first transport helicopter squadron, arrived in Korea on 31 August 1951 equipped with fifteen HRS-1's. The squadron designation HMR represents: H-Helicopter, M-Marine, and R-Transport. The naming of this squadron demonstrates a good example of how aviation in the Marine Corps had the tendency at times to chase its tail. In 1950, the Aviation Section of the Educational Center at the Marine Corps Schools was in the process of reviewing related studies on Marine aviation, when it noticed that when referencing helicopter squadrons they were continually referred to as "Assault Helicopter Squadrons." The review board felt that while the helicopter did perform the initial and primary mission of assault, it additionally had an equal direct support capability in the role of observation, general utility, supply, casualty evacuation, and additional tasks once the initial assault phase of the landing had been completed. They felt the term "assault" would tend

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<sup>26</sup> Lieutenant Colonel Eugene W. Rawlins, USMC, *Marines and Helicopters 1946-1962* (History and Museums Division, HQMC Washington D.C. 1976) p. 40.

<sup>27</sup> Lieutenant Colonel Gary W. Parker, USMC, *History of Marine Medium Helicopter Squadron 161* (History and Museums Division, HQMC Washington D.C. 1978) p. 2.



to limit the employment of the helicopter in the ship-to-shore phase and deny its use for the equally important daily post-assault tasks. Therefore, the reviewing board recommended that the designation should be changed to “Helicopter Transport Squadron.”<sup>28</sup> Consequently, to avoid confusion in employment, the Division of Aviation re-designated the new HMR squadron “Marine Helicopter Squadron.”<sup>29</sup> All this discussion and renaming was short-lived because in early 1951, the Division of Aviation in reference to a CNO directive, changed the designation again to its final version of “Marine Transport Helicopter Squadron.”<sup>30</sup>

Just thirteen days after arriving in Korea, HMR-161 undertook Operation Windmill, the first mass tactical helicopter re-supply operation in history. The operation involved carrying ammunition for support of 2d Battalion, 1<sup>st</sup> Marines who were attacking Hill 673 northward along a ridge system.<sup>31</sup> As supplies were brought in, dead and wounded were taken out. The first tactical troop lift in history took place on 21 September 1951 during Operation Summit. The purpose of Operation Summit was to relieve a Republic of Korea (ROK) unit on the frontline with a reinforced reconnaissance company. In 65 flights over a period of four hours, 224 combat equipped troops and 17,772 pounds of cargo were lifted to Hill 884, which would later become known as “Mount Helicopter.” Operation Summit received front-page headlines throughout the United States and gave Americans its first knowledge of Marine helicopters in combat.<sup>32</sup>

The Commandant of the Marine Corps, General Lemuel C. Shepherd, Jr., praised HMR-161 by saying, “The effectiveness of your support presents a bright new chapter in the employment of helicopters by Marines.” Major General Gerald C. Thomas, commanding the 1<sup>st</sup>

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<sup>28</sup> MCS memo to President, Marine Corps Board, dtd 19 Sep 50, Subj: Marine Corps Board’s study on the mission of Marine Corps aviation and its supporting establishments.

<sup>29</sup> DivAvn memo to Div P&P, dtd 22Nov 50, Subj: Marine Corps Assault Helicopter Program.

<sup>30</sup> DivAvn memo to Dir P&P, dtd 20 Mar 51, Subj: Marine Corps Transport Helicopter Program.

<sup>31</sup> Lieutenant Colonel Gary W. Parker, USMC, History of Marine Medium Helicopter Squadron 161 (History and Museums Division, HQMC Washington D.C. 1978) p. 4.

<sup>32</sup> Ibid. p. 4.

Marine Division said, “Operation Summit, the first helicopter borne landing of a combat unit in history, was an outstanding success. To all who took part, Well Done.” Operation Summit did much to establish credibility of the helicopter and HMR-161 under combat conditions.<sup>33</sup>

Building on previous experience, HMR-161 conducted Operation Bumblebee on 11 October 1951. Operation Bumblebee was the largest operation the squadron had yet performed. The purpose of this operation was to effect relief of one battalion of the 5<sup>th</sup> Marines, carrying forward the 3d Battalion, 7<sup>th</sup> Marines in successive waves to the top of a 3,000-foot mountain. The battalion of 958 men was put in place in just under six hours, each helicopter carrying a single pilot and six troops each time. This was the first time that an entire battalion had been heli-lifted in combat, demonstrating the potential for movement of large numbers of troops by helicopter.<sup>34</sup>

On 19 August 1952, Operation Ripple tested the ability of helicopters by moving rocket launchers and their accompanying personnel and equipment quickly from one firing position to another. Dubbed “Hit n’ Git” the process involved flying rocket launchers with their crews to a suitable firing position, landing, firing the rockets, then moving on by the helicopter taking the still hot rocket launcher to a new firing position before enemy artillery or mortar could locate the rocket firing position. The rocket launcher was slung under the helicopter while in transit. It took two days to perfect the operation, however, HMR-161 was able to recommend that helicopters be used for rocket battery transportation missions.<sup>35</sup>

Late in October of 1952, a newer HRS-2 helicopter appeared in Korea. There was very little difference between the HRS-1 and the HRS-2; the only notable change was that the HRS-2

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<sup>33</sup> Ibid. p. 5.

<sup>34</sup> Ibid. p. 6.

<sup>35</sup> Ibid. p. 10.

was approximately a foot longer. The engine remained the same, which made the performance of both practically identical.

By the end of the Korean War, the Marine Corps had proven the vertical assault concept for employing troops in combat. However, the major roles of the HRS-1 and -2's were casualty evacuation (CASEVAC), due to its capacity of six litters, and re-supply. These two roles, particularly that of CASEVAC, ensured the future of the helicopter on the battlefield. The Korean experience was sufficient to convince the Marine Corps, that more resources should be devoted to the research and development of larger, faster helicopters in greater quantities, and more thought given to their employment on the battlefield.

Post Korean War; at the beginning of 1955, the final version of the HRS, the HRS-3, would replace all the earlier models still in service with the Marine Corps. Again, the HRS-3 was basically the same aircraft with a more powerful engine, the R-1300, which produced 700 horsepower, an increase of 100 horsepower over the R-1340 engine, which had been used in the HRS-1 and-2 models. The horsepower increase enabled the HRS-3 to lift approximately 250 pounds more than its predecessors, the equivalent of one more combat Marine on each flight.<sup>36</sup>

### **The Advanced Research Group and the Smith Board**

“ ... The requirements of the Marine Corps for the HR2S aircraft are in no way altered by this letter...”

General Lemuel C. Shepherd, Jr.  
Commandant Marine Corps  
1955<sup>37</sup>

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<sup>36</sup> Lieutenant Colonel Gary W. Parker, USMC, History of Marine Medium Helicopter Squadron 161 (History and Museums Division, HQMC Washington D.C. 1978) p. 12

<sup>37</sup> CMC ltr to CNO, dtd 1 Mar 55, Subj: Marine Corps requirements for helicopter utility aircraft.

When General Lemuel C. Shepherd, Jr., assumed the Commandancy on 1 January 1952, his inaugural speech highlighted the successes the helicopter had achieved in its role in the Korean War and its future potential. He stated:

Seven years have passed since the development of the helicopter as a troop carrier was begun, but in the fall of 1951, in the bleak Korean countryside, the worth of the ungainly looking craft was finally proved. Just as the amphibian tractor came to the fore as a troop carrier over the reefs of Pacific atolls during World War II, so the helicopter became the greatest single innovation during the Korean conflict as a tactical and humanitarian medium of transportation ... The fact that we have a suitable helicopter transport now in sight [the HR2S] ... leaves us with a sense of confidence. I believe that the Marine Corps, with our skilled close air support and our own helicopters to pave the way for the amphibious landing, is capable of following up an atomic attack with the most powerful assault punch possessed by any nation in the world today.<sup>38</sup>

General Shepherd formed a special study group of highly experienced Marine officers whose task was to form the ultimate concept for the conduct of future amphibious operations. Starting in 1953, a group of ten Colonels would convene annually for the length of one academic year and were titled the Advanced Research Group (ARG). Each ARG was to choose a project that would be solved during the academic year. In the fourth academic year, ARG Project IV, had chosen to address the original solution to ARG Project I, which had addressed a number of areas that required further detailed study in the use of high-speed movement of helicopter assault forces to the objective area, in company with a fast carrier task force. ARG IV chose to study the Marine Corps long-range objective of an “all helicopter” assault capability. Therefore the group formally identified Project IV as “Marine Corps Transport Helicopter Requirements for the Immediate Future.”<sup>39</sup>

The initial goal of ARG IV was to define the capability required for lifting an assault element of one Marine division and the related elements of one aircraft wing. ARG IV identified

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<sup>38</sup> Montross, Lynn, *Cavalry of the Sky* (New York: Harper Brothers, 1954) p. 226.

that the shortcoming in achieving this goal was the lack in quantity of heavier transport helicopters, the one most essential piece to any significant landing operation. The group devoted their study to consideration of the larger transport helicopter only. The group felt that the minimum assault force should consist of four battalion-landing teams, landed simultaneously with additional support provided on the second wave. Further, it was calculated that sufficient helicopters would not be available for providing support for tactical operations ashore while concurrently executing a ship-to-shore movement. The ARG's conclusion was that this could be remedied by increasing the Marine Corps transport squadrons to a total of 12 with a combined strength of 180 aircraft. The helicopter that the ARG was utilizing as the study for large transport helicopters was the Sikorsky HR2S-1 that had been originated in the 1950 Navy research and development plan. In addition to carrying 20 combat troops ashore; the HR2S-1 would make it possible to lift the most crucial heavy pieces of division property; the 105-mm howitzer and the two and one-half ton truck. The Commandant agreed with the Project IV conclusion that 180 HR2S-1 helicopters were needed to meet the interim transport helicopter requirement for the Marine Corps and submitted his request to the CNO on 23 October 1954.<sup>40</sup>

Subsequently, a board convened by the Commandant at Head Quarters Marine Corps in January 1955 chaired by Lieutenant General Oliver P. Smith addressed the requirements for a medium helicopter. General Smith was fully familiar with the helicopter program, as he was one of three generals on the Commandant's special board, which drew up the original helicopter program in 1946. General Smith's board concluded that too much emphasis had been placed on

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<sup>39</sup> 1953-1954 Advanced Research Group, Project IV, Marine Corps Transport Helicopter Requirements for the Immediate Future, p. 4.

<sup>40</sup> Lieutenant Colonel Eugene W. Rawlins, USMC, Marines and Helicopters 1946-1962 (History and Museums Division HQMC US Marine Corps) 1976 p. 64.

the large transport, the HR2S-1, at the expense of medium lift, and recommended that additional medium lift squadrons of the HRS variety be added to the Marine Corps.

The Commandant also agreed with the Smith Board's recommendation to add two squadrons of medium helicopters to each aircraft group, and officially requested the additional helicopters in a letter to the CNO dated 24 May 1955. Due to severe budgetary constraints in the upcoming fiscal year, the CNO essentially told the Commandant that he had to choose between his requests for a heavy helicopter or a medium helicopter. Due to the developmental problems in the HR2S program, the Commandant opted to proceed with a build up of a medium helicopter to act as the interim for the heavy helicopter. This decision to curtail the acquisition of the HR2S met with much resistance, since the Marine Corps had planned the execution of its new concepts on the larger helicopter as the main assault transport. As a result, this decision reoriented of the entire helicopter program for the near term forcing a rethinking of equipment size, weight, and amphibious tactics to fit a medium sized helicopter force.

### **HUS-1: The Interim Helicopter**

“ ... The HUS-1 ... is being procured to meet utility helicopter requirements. Initially, however, it will be used as a transport helicopter. Upon replacement by the HR2S, the HUS will revert to utility billets.”

Division Aviation  
1953<sup>41</sup>

The Design and production of large assault helicopters continued to encounter technical difficulties, and it appeared that their introduction into the Marine Corps could be long delayed. As development problems plagued the HR2S program, the Commandant requested that the HRS helicopter act for the interim. Despite its praiseworthy performance in Korea the HRS was

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<sup>41</sup> DivAvn memo to CMC, dtd 18 Sep 53, Subj: Helicopter information, encl (2).

proving itself less than what the Marines needed, therefore, the decision was made to pursue a transport version of Sikorsky's Anti-Submarine Warfare (ASW) helicopter already in use by the Navy designated the HSS-1 (H-helicopter, S-anti-submarine, S-Sikorsky). The HSS-1's particular design was an outgrowth of even earlier models of Sikorsky helicopters, most notably the HRS-3, which had provided the Marine Corps with much of its helicopter lift capability in the early- and mid-50's.<sup>42</sup> Producing a utility version of the HSS-1, now named the HUS-1 (H-Helicopter, U-Utility, S-Sikorsky), for the Marine Corps was a relatively simple process, involving removing the ASW equipment, strengthening the cabin floor, and installing cargo tie-down rings.<sup>43</sup> Like the HRS before it, the new HUS-1 was also seen as an interim helicopter until the HR2S-1, the "true heavy" could be delivered in quantity. This interim helicopter would end up serving far longer, and in greater numbers than any other helicopter in the Marine Corps.

The Marine Corps received its first HUS-1, later re-designated the UH-34, in 1957. The UH-34 was a single rotor helicopter, with an anti-torque rotor on the tail pylon. All the blades were constructed entirely of metal. The main blades and tail pylon could be folded to permit operations on ships elevators and stowage in hangar decks on the CVE class carriers. With both the main blades and pylon folded, the dimensions of the aircraft were reduced from a length of 65.7 feet to 37 feet and a width from 56 feet to just less than 15 feet. The UH-34 was powered by a Wright R-1820-84 nine cylinder, radial, air-cooled engine rated at 1,525 horsepower mounted in the front of the aircraft behind large clamshell doors. To provide greater overall strength and improved stability on rolling decks, the aircraft was fitted with a reverse tricycle landing gear. The UH-34 could attain a top speed of about 123 knots and a cruise speed of 95 knots. The

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<sup>42</sup> Lieutenant Colonel William R. Fails, USMC, *Marines and Helicopters 1962-1973*, (History and Museums Division HQMC US Marine Corps) 1976 p. 5.

<sup>43</sup> *Ibid.* p. 5.

cockpit had a dual set of controls for both the pilot and co-pilot, who sat above and behind the engine and just forward of the main transmission.

The troop compartment of the UH-34 was placed directly under the main transmission and rotor. The cabin measured over 13 feet long and 5 feet wide and was 6 feet high with a large sliding door on the right side. The cabin had room for 12 fully equipped Marines or 8 litter cases. In addition, a 5,000-pound capacity cargo hook could be utilized to carry loads externally. A rescue hoist mounted outside just above the cargo door could be used to lift loads of up to 400 pounds. The basic weight of the UH-34 was 8,958 pounds with a maximum take-off weight of 13,300 pounds. This allowed for a payload of approximately 4,000 pounds.<sup>44</sup>

By 1962 the UH-34 was by far the most common helicopter in the Marine Corps inventory and most utilized throughout the world. Four Marine UH-34's were assigned to operate in the Antarctic, in support of the United States research program. The original helicopters designated "Marine One" from the squadron HMX-1, serving Presidents Eisenhower and Kennedy both domestically and internationally, were Marine VIP, UH-34's. Additionally, in the infancy of the Space Program, Marine UH-34's of HMM-161 played a role in recovering NASA astronauts and space capsules during Project Mercury.

The Combat history of the UH-34 started in 1961 with HMM-362 conducting Operation SHUFLY in Vietnam, operating out of Soc Trang, in the Mekong Delta. Perfecting helicopter techniques that would be used in the future years of the war the UH-34 was even armed with the Temporary Kit-1 (TK-1) consisting of two rocket pods and two M-60 machine guns to provide an offensive capability. In 1962, HMM-263 flying from the deck of the USS Boxer was providing support for the quarantine of Cuba during the October missile crisis. In 1965, UH-34's

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<sup>44</sup> Navy Dept. BuAer Standard Aircraft Characteristics, NavAer 00-110AH34-1, dtd 1 Jul 67, pp. 2-5 and Standard Aircraft Characteristics, UH-34D.



flying from the decks of the USS Okinawa with HMM-263 and HMM-264 from the USS Boxer, supported Marine operations in the evacuation and protection of Americans in the Dominican Republic. In the seven years of service in Vietnam the UH-34 had made up the bulk of the lift capability there, and performed every mission from its original duty as a troop and cargo transport to close air support, and CASEVAC.

Because of its reliability, the UH-34 could always be counted on to provide assistance to the Marine on the ground. Hence the term, “Give me a HUS” was coined and entered into the vocabulary of Marines to indicate something good or something beneficial.<sup>45</sup>

It was not until 18 August 1969 that the last Marine UH-34’s were retired from Vietnam, and between the years of 1957 and 1968, the Marine Corps had received a total of 515 UH-34’s in which the aircraft had amassed an unprecedented 580,000 flight hours. For a helicopter that was to have been nothing more than an interim model waiting for the arrival of the true heavies, the UH-34 became the backbone of the Marine vertical lift assault capability.

At the time of the last combat flight, General Leonard F. Chapman, Jr., who had been appointed Commandant on 1 January 1968, sent a message to the Sikorsky plant in Connecticut. In it he said:

As the last UH-34 is phased out of Marine Forces in Vietnam, it is appropriate to express our appreciation for the outstanding record compiled by this aircraft. Over 500 of these helicopters have flown one and a half million flight hours in 15 years. They have proven their dependability in an amazing variety of roles. They have accomplished every task from space capsule recovery to disaster relief in peacetime, and assault troop lifts to medical evacuations in war. In the rigorous combat environment in Vietnam, they have proven the Marine Corps concept of helicopter assault. Many hundreds of Marines owe their lives to this aircraft. As we look to the future with more modern aircraft, the UH-34 takes its place in our memories along with such aircraft as the F-4F, SBD, and F4U as one of the giants of Marine Aviation.<sup>46</sup>

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<sup>45</sup> Lieutenant Colonel William R. Fails, USMC, *Marines and Helicopters 1962-1973* (History and Museums Division HQMC Washing D. C.) 1978, p. 9.

The Commandants decision in 1955 to proceed with a build up of a medium helicopter to act as an interim for the HR2S-1 proved to be a sound one. It enabled the Marine Corps to maintain itself as a viable heliborne combat force, especially when needed during the Vietnam years. However, even with the spectacular success of the medium lift helicopter, the Marine Corps never lost sight of its original goal to achieve a true heavy helicopter force. Technology was improving and the introduction of a true heavy was about to make its appearance.

### **HR2S: The dream, the frustration, and the disappointment of Marine Corps planners**

“It’s a damn shame to see them go. That’s all – a damn shame.”

Gunnery Sergeant  
Donald D. Stoltz  
1967<sup>47</sup>

One model of helicopter had dominated the Marine Corps concept of assault landings for 14 years since 1948, when early planners envisioned an all heavy helicopter vertical amphibious assault. It became the most significant helicopter ever developed for the Marine Corps.<sup>46</sup> All helicopters prior to it were interim designs awaiting the introduction of it into Marine squadrons. This helicopter, on which had depended so many hopes of early planners for a true vertical envelopment capability was the HR2S.

Originally designated by Sikorsky as the XHR2S (X-experimental, H-helicopter, R-transport, 2-second model in the design, S-Sikorsky), upon completion of testing the “X” was dropped from the name making it the HR2S. Because the HRS was the most widely known helicopter in the Marine Corps at the time, the “2” designating a second model, gave rise to a

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<sup>46</sup> CMC msg to NAVPro, Stratford, Conn, dtd 18 Aug 69, Subj: UH-34 Aircraft.

<sup>47</sup> Sikorsky News, Jul 67, p. 7.

<sup>48</sup> Lieutenant Colonel William R. Fails, USMC, Marines and Helicopters 1962-1973 (History and Museums Division HQMC US Marine Corps) 1978 p. 12.

long lasting nickname in which the helicopter was universally referred to as the “Deuce.”

However, the official Department of Defense designation was the CH-37.<sup>49</sup>

Marine Corps interest in a heavy helicopter dated back to 1946 when the Commandant, General Vandegrift, convened a special board to study how to wage successful amphibious warfare in the future. Three Colonels who made up the Secretariat of the special board reasoned that the use of helicopters in conducting amphibious assaults would require a helicopter larger than anything that had been built up to that time. The Secretariat visited the Sikorsky Aircraft Corporation and was told by Mr. Sikorsky that, “We can do that ...”<sup>50</sup>

In March 1947, Assistant Commandant Lemuel C. Shepherd, Jr., spelled out in a letter to Admiral Forrest Sherman, the then Deputy Chief of Naval Operations (DCNO (OPS)), helicopter requirements that only the HR2S could begin to meet. He stated, “the principal requirement for the helicopter for use in assault landing in amphibious warfare is a minimum payload of 3,500 pounds, or 15 fully equipped infantrymen, but that an extension of the load limit to 5,000 pounds or twenty infantrymen would greatly enhance the value of the aircraft.”<sup>51</sup> Shepard thus called for a helicopter that in one step could take the entire concept of vertical envelopment from an untested idea into an actual capability. This was particularly forward thinking at the time considering that helicopters at present could barely lift a pilot and two or three passengers. In March 1951 Sikorsky received the contract to begin building the HR2S.<sup>52</sup>

The HR2S was of typical Sikorsky design with a single five-bladed main rotor measuring 72 feet, and a four-bladed anti-torque rotor of 15 feet all powered by two Pratt and Whitney R-2800-54 engines producing 4,200 horsepower. In an advanced design, the engines were mounted

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<sup>49</sup> Ibid. p. 12.

<sup>50</sup> BGen Edward C. Dyer, USMC (Ret.) Transcript of Interview by Oral History Unit, HQMC, dtd 19 Aug 68 (Oral HistColl, Hist&MusDiv, HQMC), p. 198

<sup>51</sup> CMC ltr to DCNO (OPS), dtd 24 May 47, Subj: Employment of helicopters in amphibious warfare.

in nacelles or pods at the end of short wings extending from the top of the aircraft, housing retractable landing gear. The pilot and co-pilot sat in a cockpit mounted high over the front of the aircraft, which was accessed by a ladder. Below the cockpit, large clamshell doors opened and a ramp could be lowered to drive vehicles in and out. On the far aft, right side of the fuselage was a small cargo door, which had an overhead monorail extending the length of the aircraft for the loading and unloading of palletized cargo. To aid in handling and stowage on a ship, the HR2S was the first helicopter to have a hydraulic powered blade folding system that enabled the pilots to electrically fold the blades from the cockpit.<sup>53</sup>

Impressive as the HR2S appeared to be, it was extremely difficult to manufacture. The first aircraft was delivered to MCAS New River in March 1955, however, design and testing problems continued to delay the production and in 1956 the Marine Corps was alarmed. Ironically, only 55 HR2S's were delivered to the Marine Corps, a far cry from the 180 recommended by the ARG's Project IV.

In 1965, for the first and only time, a full squadron of twelve HR2S's making up HMH-461 (H-Helicopter, M-Marine, H-heavy), did deploy on board the USS Guadalcanal as the aviation component of a Caribbean Ready Force. Additionally several aircraft did see service in Vietnam. However, due to its severe limitations in performance, on January 25 1966, General Krulak at FMFPac headquarters requested that the HR2S be phased out of Vietnam by 1 September 1966. On 14 May 1967, the HR2S made its last operational flight in Vietnam and was literally never to fly in the Marine Corps again.<sup>54</sup>

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<sup>52</sup> Lieutenant William R Fails, USMC, *Marines and Helicopters 1962-1973* (History and Museums Divisions HQMC US Marine Corps) 1978 p. 12.

<sup>53</sup> Bureau of Aeronautics, *Standard Aircraft Characteristics: HR2S-1* dtd 30 Aug 58.

### **CH-53A: Son of a Deuce**

“The ... big void in our inventory is the large helicopter. The follow on to the HR2S is referred to as the HH (X) [Helicopter, heavy, experimental] It is anticipated that that BuWeps will go out to industry some time soon in order to complete the evaluation ... before [July 1962.]”

Director of Aviation  
1962<sup>55</sup>

The CH-53 is the result of the Marine Corps quest to replace the piston-engined HR2S with a turbine-engined large transport helicopter. The Bureau of Weapons (BuWeps) took bids from any interested manufacturer for the replacement of the HR2S. Since the Vietnam War was ongoing and the theater of operations was short of heavy lift helicopters, in an effort to expedite production, all proposals had to be based on an existing helicopter.<sup>56</sup>

The HR2S had never achieved its full potential due to production problems and the lack of power resulting from the use of piston engines. Sikorsky still believing in the design of the HR2S took the technology and applied it to a series of helicopters called “flying cranes.” The crane concept had no cabin for passengers or cargo. The cockpit, engines, rotors and landing gear were affixed to a central keel. The payload was to be carried externally underneath the aircraft. Originally, Sikorsky had modified the basic structure of the HR2S to arrive at the first crane designated the S-60. Unfortunately, the S-60 was still driven by the same piston engines as the HR2S and consequently lacked the power to achieve the break through that the Marine Corps was looking for in heavy lift.<sup>57</sup> With the advent of turbine powered engines, Sikorsky produced a second version powered by jet engines and designated it the S-64. With the new power provided

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<sup>54</sup> Lieutenant Colonel William R. Fails, USMC, Marines and Helicopters 1962-1973 (History and Museums Division HQMC US Marine Corps) 1978 p. 98.

<sup>55</sup> DirAvn ltr to Dist. List, dtd 18 Jan 62, Subj: News Letter (Ser. 008A1862/A).

<sup>56</sup> Lieutenant Colonel William R. Fails, USMC, Marines and Helicopters 1962-1973 (History and Museums Division, HQMC Washington D.C. 1978) p. 58.

<sup>57</sup> Ibid. p. 58.

by the turbine engines the S-64 became a commercial success and saw service with the Army in Vietnam.

In 1962 Sikorsky won the contract for the Marine HH (X) with the S-65. The S-65 was essentially the S-64 flying crane with a cargo and passenger cabin built back on to accommodate large pieces of cargo internally.<sup>58</sup> There was a silent cheer throughout the Sikorsky Aircraft Corporation, with the production of the S-65, re-designated the CH-53A, the evolution of the HR2S, the “Deuce”, had come full circle.

The CH-53A was truly the son of a “Deuce.” Their dimensions were almost identical. The CH-53A had a 72-foot six-bladed main rotor and a four bladed 16-foot anti-torque tail rotor. For shipboard stowage the blades and tail pylon could be folded. Tricycle landing gear retracted into the fuel sponsons or the aircraft fuselage. Two General Electric T-64-GE-6 engines were mounted on either side of the main transmission. The engines could produce 2,270 maximum continuous horsepower, which meant on a normal mission the CH-53 could carry 38 combat equipped troops, or 24 litter patients or, 8,000 pounds of cargo in the cabin or externally, for a radius of over 100 nautical miles. A rear ramp allowed vehicles to drive in and out.<sup>59</sup>

The CH-53 had been designed as an amphibious vertical assault helicopter, however by 1967 it entered service in Vietnam performing in a role, which it had descended from, that of a flying crane.<sup>60</sup> During Vietnam, retrieval of downed aircraft was in many cases very practicable. However, unlike Korea, where there were more defined battle lines and pilots usually managed to land a stricken aircraft on the American side; in Vietnam most came down in areas easily accessible by Viet Cong (VC) Forces. Where in Korea it was common practice to provide

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<sup>58</sup> Ibid. p. 58.

<sup>59</sup> NavAirSysCom, Standard Aircraft Characteristics, Navy Model CH-53A Aircraft dtd 1 Jul 67.

<sup>60</sup> Lieutenant Colonel William R. Fails, USMC, Marines and Helicopters 1962-1973 (History and Museums Division, HQMC Washington D.C. 1978) p.114.

security for an aircraft while it was being dismantled for external lift back to an airfield, Vietnam did not provide this luxury. Due to the highly mobile character of the VC, there was no time available for this kind of procedure. If an aircraft went down, it had to be retrieved immediately, which meant in one piece, before the VC could get to it and destroy it or worse, use it as raw materials for their war effort. For the Marines, retrieving aircraft was extremely important for it meant if nothing else, salvaging the wreckage for as many spare parts as possible. The CH-53 fulfilled this role perfectly by being able to lift all USMC helicopters without stripping or dismantling them.

Three modifications that came to the CH-53A were due to the direct result of combat experience in Vietnam. Armor was to be added to critical areas of the engines and controls. M-60 machine guns, operated by the crew chiefs, were installed in each crew door for a needed self-defense capability, and, due to the damaging effects of sand and the talcum like red soil of Vietnam known as laterite, engine air particle separators (EAPS) were fitted to the engine intakes to protect the engine from the erosive effects of the soil.

The CH-53A performed its mission as a retriever impressively, however, it did much more. The benefit of the 53's lifting capacity was the ability to transport heavy loads of artillery, ammunition and construction equipment to isolated firebases, where roads were non-existent or controlled by the VC. The CH-53 played a vital role during the siege of Khe San, where it was one of the few aircraft that could get in and out having delivered much need supplies.

During the time frame of 1968-69, the A-model was upgraded with more powerful engines and re-designated the CH-53D. The D-model was identical in dimensions to the A-model, however, more powerful engines allowed it to carry 55 troops or a maximum payload of 12,000 pounds. 126 CH-53D's were manufactured and saw service in Vietnam. The last D-

model was manufactured in 1972; however, by that time the CH-53D had seen service in Operations Eagle Pull and Frequent Wind in Vietnam, Operation Urgent fury in Grenada, Operations Desert Shield and Desert Storm in the Persian Gulf, and Operation Restore Hope in Somalia.

### **CH-53E: The vision realized**

“I believe that helicopters with a gross weight of 50,000 pounds and a lifting capability of between 30 and 50 percent of this figure can be designed in the near future. It will have a range from 100 up to 1,000 miles and eventually probably up to 2,000 miles...utilizing...inflight refueling....”

Igor Sikorsky  
1949<sup>61</sup>

In Vietnam the CH-53 was proving extremely successful as a helicopter retriever. However, if a 53 itself went down, it still had to be dismantled partially before another 53 could come in and pick it up for a recovery. Furthermore, there were still items of equipment, which Marines needed in an amphibious landing that were still beyond the lift capability of the CH-53A/D. What the Marine Corps needed was a helicopter which, in an emergency, could lift its own weight as well as carry more types of heavy equipment during amphibious operations.<sup>62</sup>

In 1972, Sikorsky proposed the YCH-53E, which was basically a CH-53D with a third engine to improve its lift capability. This modification was extremely attractive to the Marine Corps, for it meant that it would not require an extensive redesign of the aircraft with the usual delays and expenses that accompanied it. Adding a seventh blade to the main rotor, canting the tail rotor 20 degrees to the left, lengthening the fuselage by ten feet, increasing the fuel capacity,

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<sup>61</sup> Igor Sikorsky, “Military Future of the Helicopter,” Marine Corps Gazette Vol. 33, No. 8.



installation of a third engine and for the first time on a pure transport helicopter, adding a refueling probe, Igor Sikorsky's vision of 1949 became a reality.

Its name was the CH-53E. It was 73 feet in length, and weighed 33, 228 pounds empty. Three T-64-GE-416 turbo shaft engines produced 11,340 horsepower, which drove a seven bladed 79-foot main rotor. Depending on fuel load, the CH-53E could lift up to 40,000 pounds; reach a maximum airspeed of 196 miles per hour and had a radius of 500 nautical miles.<sup>63</sup>

The CH-53E was given the name "Super Stallion", and saw its first combat service in Lebanon, when it was used to carry in howitzers to the Marine base at the Beirut Airport in 1983. In 1991, two Super Stallions participated in Operation Eastern Exit, which was a long-range mission requiring two in-flight refuelings from a C-130 tanker to evacuate US diplomats from Mogadishu, Somalia. The CH-53E also participated in Operations Desert Shield and Desert Storm, to include the follow on mission of Operation Provide Comfort in Northern Iraq. The Super Stallions were seen again as the first in and last out in the ill-fated mission of Operation Restore Hope in Somalia. Because of its long range capability, the Super Stallion was chosen as the rescue aircraft for a downed F-16 pilot named Scott O'Grady when his plane was shot down deep inside enemy territory in Bosnia-Herzegovina.

With the production of the CH-53E Super Stallion, the Marine Corps made the final step in achieving a "Heavy Lift Helicopter" that fulfilled the vision of the early Marine Corps planners in 1947, albeit twenty-five years late. However, now that a suitable heavy lift helicopter has been realized, can it reclaim the centerpiece of Marine amphibious doctrine?

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<sup>62</sup> Lieutenant Colonel William R. Fails, USMC, *Marines and Helicopters 1962-1973* (History and Museums Division, HQMC Washington D.C. 1978 p. 167.

## **Conclusion**

With the introduction of the helicopter program, the Marine Corps endeavored to make the boldest changes to the character of its World War II style of amphibious operations. The helicopter, with its ability to land troops and supplies inland, would eliminate the massing of ships off the coast and possibly eliminate the engagement of the enemy at the most vulnerable point of contact, the water's edge.<sup>64</sup>

The original concept of future amphibious operations as proposed in Landing Bulletin Number 17, stated:

This concept has as its ultimate goal an all-helicopter assault which will endow the amphibious attack with the maximum freedom of action. We have already progressed to a point at which our doctrine embraces a powerful two-pronged attack, one prong vertical envelopment by helicopter, the other a surface assault across the beach by conventional means, with the latter constituting the main effort. In the future, while improving our still-essential beach-assault ability, we must adapt our organization and equipment, and our tactics, techniques, and training, so as to place major stress on the helicopter assault. Later, as new amphibious ships join the fleet, and as helicopters with greater load capacity become available in quantity, the beach assault can be reduced still further. Eventually, when the concept is fully realized, the beach assault can be eliminated altogether ...<sup>65</sup>

This decision of phasing out the conventional landing craft beach assault, led to the search for the proper type helicopter that could replace the conventional landing craft. To bring a Regimental Landing Team (RLT) ashore, two pieces of equipment that were considered vital for the ground commander were radio jeeps. The first was the Mark 87, utilized by the air liaison officer, which provided the critical link between the commander requesting close air support, and the attack aircraft that would deliver it. The second was the Mark 83, used by the naval gunfire observer to provide a similar link to the ships off shore and to artillery units firing in support of

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<sup>63</sup> C. M. Reed, H-53 Sea Stallion in Action (Signal Publications), p. 41.

<sup>64</sup> Lieutenant Colonel Eugene W. Rawlins, USMC, Marines and Helicopters 1946-1962 (History and Museums Division HQMC, Washington D. C. 1976) p. 38.

the assault elements.<sup>66</sup> Both radio jeeps had to go ashore early in the assault, therefore, the Marine Corps decided to make its heliborne forces up entirely of large, or heavy lift helicopters that could accommodate this type of load. Thus, the beginning of “Heavy Lift” was born in the Marine Corps.

The result of the Marine Corps requirements for a large assault transport helicopter was the HR2S-1. It was a multiengine helicopter capable of carrying up to 20 combat equipped Marines or a 5,000-pound payload. The HR2S-1 was the helicopter that the Marine Corps planners were basing the success of the Vertical Amphibious Assault Concept on.

Plagued by design and production problems of the HR2S-1, the Marine Corps chose to replace the HR2S-1 with an interim helicopter that was considered medium lift. This helicopter was known as the HUS-1 (also called the UH-34). It saw extensive service throughout the Marine Corps, particularly in Vietnam, and became the highest number of same type aircraft that the Marine Corps procured, ending with 515 in Marine service. The praiseworthy performance of the UH-34, is the reason the Marines opted to build up the medium lift concept, which tentatively put an end to the original Marine planners concept of an all heavy lift force.

When the HR2S-1 finally did come on line in sufficient numbers in 1956, its performance never achieved the desired results, and the all heavy lift concept became permanently overshadowed by the medium lift concept. To the consternation of the original planners, the Marine Corps reoriented the entire program towards medium lift; however, they never gave up on the concept of developing a true heavy lift helicopter.

The result was the CH-53, eventually leading to the CH-53E. The CH-53E was a three-engine helicopter able to lift its own weight as well as most types of heavy equipment needed for

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<sup>65</sup> HQMC, Landing Force Bulletin Number 17: Concept of Future Amphibious Operations, dtd 13 Dec 55.

an amphibious operation. During the Carter Administration, the Marine mission shifted to supporting NATO's flank by defending Norway. The result was a "heavying up" of Marine units. The new M198 155-mm towed howitzer entered Marine service, the weapon being so large that only the CH-53E could lift it.<sup>67</sup> Similarly, the decision to acquire Light Armored Vehicles (LAV's) made the CH-53E the only suitable helicopter for their movement from ship-to-shore. The Marine Corps acquired significant numbers of the CH-53, but never with the intention of replacing the medium lift amphibious assault force. The CH-53E had been relegated to performing missions of transporting specialized items of equipment that no other helicopter could lift, if that equipment did not go by surface means.

Therefore, the historical analysis shows us, that the heavy lift helicopter, designed to be the backbone of the new Vertical Assault Concept for Amphibious Operations, had become relegated to much fewer numbers with a specialized mission of carrying the Marine Corps heaviest pieces of equipment needed for an amphibious landing. The demise of heavy lift as the backbone of the Vertical Assault Concept, truly began, with the fact that the technology of a heavy lift helicopter was not feasible until 1955, by which time the Marine Corps had reoriented to become a medium lift force. With the reorientation to a medium lift force, and the poor performance of the HR2S-1, the end of the all heavy lift force had apparently come to an ignominious end. However, the success of the CH-53E may resurrect the concept of an all heavy lift force.

Today, the Marine Corps has based its OMFTS doctrine on the MV-22 Osprey, which is an aircraft design that consists of twin rotor-engine nacelles mounted on a connecting wing; the nacelles rotate to a horizontal position for conventional forward aircraft flight and are vertical for

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<sup>66</sup> Lieutenant Colonel William R. Fails, USMC, *Marines and Helicopters 1962-1973* (History and Museums Division, HQMC, Washington DC, 1978) p. 17.

vertical take-off and landing or hover. The speeds of the Osprey will be at a minimum of 100 miles per hour faster than any helicopter flying today. The MV-22 will be able to carry 24 combat-loaded Marines or 10,000 pounds internal cargo. With an external hook underneath the aircraft, the Osprey can transport a 15,000-pound load.<sup>68</sup>

In an ironic twist of fate the medium lift replacement MV-22 has encountered long delays in development and production reminiscent of the problems encountered with the manufacturing of the HR2S-1. Could the MV-22 be the HR2S-1 of present day? It seems that history is about to repeat itself except with a role reversal. While Marines were eagerly awaiting its production plagued heavy helicopter, the vertical assault concept was usurped by a medium lift interim. Today, OMFTS, which is completely based on medium lift, could possibly be usurped by the CH-53E, while the Marine Corps is awaiting the arrival of the Osprey.

Currently, the CH-53E is a vital but not main component of OMFTS. Whether performing in a specialized role of lifting the heaviest pieces of equipment that the Marine Corps owns, acting in the capacity of a supplemental troop carrier, or utilizing its long range in-flight refueling capability for special operations missions, the 53E will continue to play a major role in the Marine Corps until it reaches the end of its service life.

The CH-53E production line is in fact closed down, however, of the 163 Super Stallions spread over six active duty and two reserve squadrons, 111 are scheduled for a Service Life Extension Program (SLEP). The result will be a totally remanufactured Super Stallion, which will be restored to "like new" Condition. The SLEP is expected to extend the CH-53E's operational service to 2025.<sup>69</sup>

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<sup>67</sup> Peter B. Mersky, *Amphibious Warfare: an illustrated history* (Imprint London: Blanford, 1988) p. 171

<sup>68</sup> *Ibid* p. 174.

<sup>69</sup> Craig Bonholtzer, "Super Stallion: Mission to Afghanistan." *Rotor & Wing*, March 2002, p.20.

The MV-22 is a replay of the lessons learned in the development of the HR2S. The production plagued MV-22 has left the Marine Corps in the position of executing OMFTS without the centerpiece of the Osprey. Therefore, the Marine Corps should heed the lessons of 1947 and proceed with the SLEP and additionally re-open the production line of the CH-53E with the intent to replace the Osprey. In doing so the Marine Corps will have the CH-53E acting as an interim helicopter enabling the execution OMFTS. With this move, the original designers of the HR2S-1 would be happy to see that the heavy lift helicopter has finally become the anchor of the Marine Corps amphibious doctrine.

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